

METHOD OF DISCHARGING LIQUID MATERIAL AND APPARATUS THEREFOR

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Inventor: IKUSHIMA KAZUMASA

Applicant: MUSASHI ENG KK

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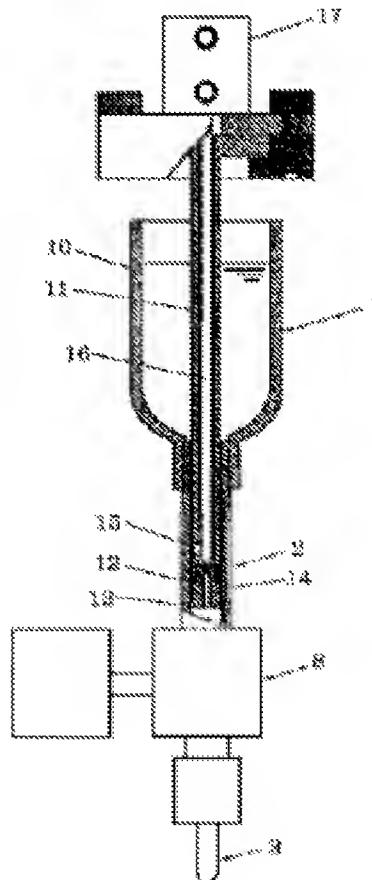
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Abstract of JP2003126750

PROBLEM TO BE SOLVED: To provide a method of precisely discharging, dropping and spraying a liquid material and an apparatus therefor. **SOLUTION:** In the method of discharging the liquid material by pressurizing the liquid material by a plunger being slid in close contact with the inside surface of a liquid feeding passage, with which a nozzle is communicated to a storage part, thereby discharging the liquid material from the nozzle, the plunger is arranged in the mid-way of a space where the liquid material is filled. The space is divided into a nozzle side liquid material part and a storage vessel side liquid material part by a sliding surface of a plunger part being slid in contact with the inside wall surface of the liquid feeding passage, and the liquid material in the nozzle side liquid material part in the divided liquid is discharged by advancing the plunger part in the liquid feeding passage. The liquid material discharge apparatus is composed of the liquid material storage part for storing the liquid material, the nozzle part for discharging the liquid material, the liquid feeding passage with which the storage part is communicated to the nozzle part, the plunger part being slid in close contact with the inside surface of the liquid feeding passage and having a seal part and a plunger moving means for moving the plunger part forward and backward. The apparatus is also provided with the liquid feeding passage with which the nozzle side terminal neighborhood of the liquid feeding passage is communicated to the liquid material storage part neighborhood of the liquid feeding passage 2 or the liquid storage



part, and a liquid sending valve arranged in the liquid feeding passage terminal of the liquid feeding passage 2 or in the mid-way of the liquid feeding passage 2.

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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*)�.
2. Texts in the figures are not translated and shown as it is.

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**[Claim(s)]**

[Claim 1] The discharge method of the sap-wood which pressurizes sap-wood by the plunger which sticks to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slides on it, and carries out discharge from a nozzle.

[Claim 2] The discharge method of sap-wood of Claim 1 which arranges a plunger in the middle of the space filled with sap-wood.

[Claim 3] Claim 1 or the discharge method of sap-wood of 2 divide in the nozzle side sap-wood part and the storage container side sap-wood part, and said plunger part carries out advance operation of the inside of a liquid transport way, and makes sap-wood of the nozzle side sap-wood part breathe out among the divided liquids by the sliding surfaces of the plunger part which sticks to the inner wall surface of a liquid transport way, and slides on it.

[Claim 4] The discharge method of sap-wood of Claim 3 which it has [ Claim 3 ] the valve system in which a plunger part opens for free passage or intercepts the nozzle side sap-wood part and the storage container side sap-wood part, carries out advance operation of the inside of a liquid transport way for a valve system in the state of stoppage, and makes sap-wood breathe out.

[Claim 5] Claim 3 or the discharge method of sap-wood of 4 of consisting of plunger heads by which the tip of a plunger part has been arranged in a channel, and a plunger head carrying out advance movement in sap-wood, and carrying out discharge of the sap-wood.

[Claim 6] Claim 3, the discharge method of sap-wood of 4 or 5 of consisting of the 1st process which makes the nozzle side sap-wood part a closed region, the 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, and the 3rd process which advances and carries out discharge of the plunger part.

[Claim 7] The 1st process is the discharge method of sap-wood of Claim 6 including the 5th

process which opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage.

[Claim 8] Claim 6 or the discharge method of sap-wood of 7 including the 4th process which removes the air bubbles of sap-wood in a liquid transport way between the 2nd process and said 3rd process.

[Claim 9] The 4th process is the discharge method of sap-wood of Claim 8 which consists of the 6th process which makes the nozzle side sap-wood part a closed region, and opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage, and the 7th process which carries out advance movement of the plunger part.

[Claim 10] Claim 6 or the discharge method of one sap-wood of 9 of making a blockade means a liquid transport way end or the discharge valve arranged in the middle of the liquid transport way.

[Claim 11] A blockade means is the discharge method of sap-wood of Claim 10 which blockades the discharge mouth at the tip of a nozzle.

[Claim 12] The 5th process is the discharge method of sap-wood of Claim 7 by the valve system prepared in the plunger part, or either of 11.

[Claim 13] The liquid transport way which opens for free passage the sap-wood storage part which stores sap-wood, the nozzle part which carries out discharge of the sap-wood, and said storage part and said nozzle part, The plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, [ said plunger part / it comes out with the plunger transportation device which carries out attitude movement, is constituted, and ] Discharge equipment of the sap-wood characterized by having the liquid transport way end of the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a liquid transport way near the nozzle side end of a liquid transport way for free passage, and said liquid transport way 2, or the liquid transport valve \*\*\*\*(ed) in the middle of liquid transport way 2.

[Claim 14] The liquid transport way which opens for free passage the sap-wood storage part which stores sap-wood, the nozzle part which carries out discharge of the sap-wood, and said storage part and said nozzle part, The plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, The plunger transportation device which carries out attitude movement of said plunger part, and the discharge valve \*\*\*\*(ed) in the middle of the nozzle side end of a liquid transport way, or the liquid transport way, the discharge equipment of the sap-wood characterized by coming out with the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a discharge valve and a liquid transport way for free passage, being constituted, and said discharge valve taking the second position which opens for free passage the first position which opens a liquid transport way and a nozzle for free passage, and a liquid transport way and the liquid transport

way 2.

[Claim 15] The liquid transport way which opens for free passage the sap-wood storage part which stores sap-wood, the nozzle part which carries out discharge of the sap-wood, and said storage part and said nozzle part, the discharge equipment of the sap-wood characterized by having the valve system intercepted or it comes out with the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, and is constituted and said plunger part opens said nozzle part and said storage part for free passage.

[Claim 16] Discharge equipment of sap-wood of Claim 15 characterized by having a discharge valve in the middle of said liquid transport way near the nozzle side end of said liquid transport way.

[Claim 17] Claim 15 or 16 liquid discharge equipment which are characterized by the inside diameter of said liquid transport way and the inside diameter of said discharge valve considering it as the diameter of said substantially.

[Claim 18] The plunger rod with which said plunger part has a tubular portion, and said tubular portion has an outer wall side and the hole 1 open for free passage, The plunger head which it is equipped with at the tip of said plunger rod, has the tubular portion of said plunger rod, and the hole 2 open for free passage, and has the seal part stuck to an outer wall with the wall surface in a liquid transport way, The valve rod inserted in the tubular portion of said plunger rod, and the valve rod drive means which makes said valve rod stick or estrange with said plunger head, a valve rod, the valve drive means which carries out attitude operation of the valve rod, Claim 15 characterized by being come out and constituted, or the discharge equipment of one sap-wood of 17.

[Claim 19] The 1st process which closes a discharge valve and opens the valve rod inserted in the tubular portion of a plunger head and a plunger rod, The 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, Discharge equipment of sap-wood of Claim 18 which is made to carry out retreat movement of the plunger part, and carries out discharge of the sap-wood according to the 2nd process which moves sap-wood to the nozzle side sap-wood part from the storage side sap-wood part, the 3rd process which opens a discharge valve and closes a valve rod, and the 4th process which advances a plunger part.

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#### [Detailed Description of the Invention]

##### [0001]

[The technical field to which industry belongs] This invention relates to the field which pressurizes sap-wood by the plunger which sticks to the inner wall surface of a liquid transport

way, and slides on it, and carries out discharge from a nozzle. The unnecessary dryness adherence in the liquid transport way inside of sap-wood and unnecessary leakage of sap-wood from a plunger are prevented. Moreover, volume which \*\*\*\* a plunger and pressurizes sap-wood is lessened, and it breathes out with sufficient accuracy, and is related with the discharge method of sap-wood and equipment which abolish loss of sap-wood in the cellular removal work in sap-wood, and use sap-wood efficiently further. Here, discharge is discharge [ sap-wood ] and making it drop and \*\*\*\*.

[0002]

[Description of the Prior Art] As technology of \*\*\*\*(ing) sap-wood, the plunger which performs retreat operation and attitude operation is used. Although the technology of making it stopping rapidly, carrying out the seal of approval of the force of inertia to the sap-wood located ahead of a plunger, and \*\*\*\*(ing) sap-wood according to this force of inertia by making the plunger which carries out rapid advance contacting a valve seat is known In order to make the valve seat of the solid which stops force of inertia required of this technology in order to make sap-wood \*\*\*\*, and the solid plunger which exercises contact, and to obtain movement of a plunger by stopping in an instant There was a problem that damage to a plunger and a valve seat will be intense, and the damaged piece of a member will mix and dissolve at sap-wood.

[0003] Then, by these people's doing high-speed advance of the plunger that the above-mentioned problem should be solved, after making the tip side of the plunger for sap-wood discharge close to sap-wood, and subsequently stopping a plunger drive means rapidly It was made to stop rapidly, without making the plunger which carries out rapid advance contact a valve seat, force of inertia was impressed to the sap-wood located ahead of a plunger, and the technology of \*\*\*\*(ing) sap-wood according to this force of inertia was proposed (application for patent No. 319074 [ 2001 to ]).

[0004]

[Problem to be solved by the invention] Although the desired end has attained invention of the above-mentioned point \*\*, the following problems produced it in the stage of carrying out this invention.

[0005] [ the sap-wood which oozed out little by little from the seal part of the plunger ] if attitude move operation of a plunger is repeated It will dry and adhere on the wall surface in a metering zone, the sliding smooth nature of a plunger will be barred, sap-wood leaks out from about [ that the fixed-quantity nature of discharge is spoiled ], and a seal part, and sap-wood may not no longer be breathed out finally.

[0006] In order that [ moreover, ] sap-wood may follow the course which flows into a measurement pipe through a sap-wood supply valve in said equipment from the storage container which stores sap-wood Sap-wood from a measurement pipe to a sap-wood supply valve will also be pressurized by advance operation of a plunger, unnecessary sap-wood

occupancy space will spread in the discharge system which desires a steep pressure increase, and it becomes the factor which bars a steep pressure increase.

[0007] Furthermore, in said equipment, in order to emit the gas discharged toward the open air from the discharge hole in which cellular omission was prepared by the plunger rod, it is mixed with a cellular group, a liquid may be discharged, and this must be conventionally wiped off by Wes's etc. means.

[0008] For this reason, since sap-wood adhered to a plunger member, equipment became dirty, and the liquid was useless although it was a still slighter quantity. Although it could not do [ this slight quantity or ] vainly, when the influence a fixed quantity of air bubbles have on discharge was taken into consideration, since the expensive liquid in particular was not able to expect a fixed quantity of discharge, even if it made the expensive liquid useless, it could not but discharge air bubbles with the liquid which air bubbles mixed. Moreover, when making it \*\*\*\*, it may not \*\*\*\* for air bubbles.

[0009] Then, this invention solves this problem and it makes to offer discharge, the method of dropping and \*\*\*\*(ing), and equipment with sufficient accuracy into a technical problem.

Moreover, let it be a technical problem to offer the discharge method of a liquid which does not make useless the sap-wood which discharges effectively the air bubbles mixed in sap-wood, is further mixed with a cellular group at the time of cellular removal work, and is discharged at all, but makes use possible at discharge, dropping, and \*\*\*\*, and equipment.

[0010]

[Means for solving problem] This invention makes the summary the discharge method of the sap-wood which pressurizes sap-wood by the plunger which sticks to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slides on it, and carries out discharge from a nozzle.

[0011] It is the discharge method of the sap-wood which is arranging the plunger in the middle of the space filled with sap-wood, pressurizes sap-wood by the plunger which sticks to the inner wall surface of the liquid transport way which opens for free passage the nozzle arranged in the middle of and a storage part in that case, and slides, and carries out discharge from a nozzle. [ the space where this invention is filled with sap-wood ]

[0012] [ with the sliding surfaces of the plunger part which sticks to the inner wall surface of a liquid transport way, and slides on it ] The inside of the liquid which divided in the nozzle side sap-wood part and the storage container side sap-wood part, and was divided, Said plunger part carries out advance operation, is making the inside of a liquid transport way breathe out, and sap-wood of the nozzle side sap-wood part in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] It is the discharge method of the sap-wood

characterized by dividing in the nozzle side sap-wood part and the storage container side sap-wood part, and for said plunger part carrying out advance operation of the inside of a liquid transport way, and making sap-wood of the nozzle side sap-wood part breathe out among the divided liquids.

[0013] A plunger part opens the nozzle side sap-wood part and the storage container side sap-wood part for free passage. Or have the valve system to intercept, carry out advance operation of the inside of a liquid transport way for a valve system in the state of stoppage, are making sap-wood breathe out, and in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] The inside of the liquid which divided in the nozzle side sap-wood part and the storage container side sap-wood part, and was divided, It is the discharge method of the sap-wood characterized by for the plunger part equipped with the valve system which intercepts sap-wood of the nozzle side sap-wood part or it opens the nozzle side sap-wood part and the storage container side sap-wood part for free passage carrying out advance operation of the inside of a liquid transport way in the state of stoppage, and making a valve system breathe out.

[0014] The tip of a plunger part consists of plunger heads arranged in a channel, and a plunger head carries out advance movement in sap-wood, is breathing out sap-wood, and in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] The inside of the liquid which divided in the nozzle side sap-wood part and the storage container side sap-wood part, and was divided, It is the discharge method of the sap-wood characterized by for the plunger part which consists of plunger heads by which the tip has been arranged in a channel in sap-wood of the nozzle side sap-wood part carrying out advance movement, and making the plunger head breathe out in sap-wood.

[0015] The 1st process made into a closed region by a blockade means which makes the nozzle side sap-wood part a closed region, and which this better \*\* makes a closed region by the liquid transport way end or the discharge valve arranged in the middle of the liquid transport way to blockade the discharge mouth at the tip of a nozzle more preferably, Carry out retreat operation of the plunger part, consist of the 2nd process which supplies a liquid from a sap-wood storage part in a liquid transport way, and the 3rd process which advances and carries out discharge of the plunger part, and in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] The inside of the liquid which divided in the

nozzle side sap-wood part and the storage container side sap-wood part, and was divided, It is the way said plunger part carries out advance operation of the inside of a liquid transport way, and makes sap-wood of the nozzle side sap-wood part breathe out. The 1st process made into a closed region by a blockade means which makes the nozzle side sap-wood part a closed region, and which this better \*\* makes a closed region by the liquid transport way end or the discharge valve arranged in the middle of the liquid transport way to blockade the discharge mouth at the tip of a nozzle more preferably, The 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, It is the discharge method of the sap-wood characterized by consisting of the 3rd process which advances and carries out discharge of the plunger part.

[0016] The 1st process includes the 5th process which opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage, and preferably [ the 5th process ] It is based on the valve system prepared in the plunger part, and if needed between the 2nd process and said 3rd process Include the 4th process which removes the air bubbles of sap-wood in a liquid transport way, and in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] The inside of the liquid which divided in the nozzle side sap-wood part and the storage container side sap-wood part, and was divided, It is the way said plunger part carries out advance operation of the inside of a liquid transport way, and makes sap-wood of the nozzle side sap-wood part breathe out. Include the 5th process by the valve system preferably prepared in the plunger part including the 5th process which opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage. The 1st process made into a closed region by a blockade means which makes the nozzle side sap-wood part a closed region, and which this better \*\* makes a closed region by the liquid transport way end or the discharge valve arranged in the middle of the liquid transport way to blockade the discharge mouth at the tip of a nozzle more preferably, The 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, It is the discharge method of the sap-wood characterized by including the 4th process which consists of the 3rd process which advances and carries out discharge of the plunger part, and removes the air bubbles of sap-wood in a liquid transport way between the 2nd process and said 3rd process if needed.

[0017] The 6th process which the 4th process makes the nozzle side sap-wood part a closed region, and opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage, Consist of the 7th process which carries out advance movement, and a plunger part in that case [ this invention ] [ with the sliding surfaces of the plunger part arranged in the middle of the space preferably filled with sap-wood which stick to the inner wall surface of the

liquid transport way which opens a nozzle and a storage part for free passage, and slide on it ] The inside of the liquid which divided in the nozzle side sap-wood part and the storage container side sap-wood part, and was divided, It is the way said plunger part carries out advance operation of the inside of a liquid transport way, and makes sap-wood of the nozzle side sap-wood part breathe out. Include the 5th process by the valve system preferably prepared in the plunger part including the 5th process which opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage. The 1st process made into a closed region by a blockade means which makes the nozzle side sap-wood part a closed region, and which this better \*\* makes a closed region by the liquid transport way end or the discharge valve arranged in the middle of the liquid transport way to blockade the discharge mouth at the tip of a nozzle more preferably, Carry out retreat operation of the plunger part, consist of the 2nd process which supplies a liquid from a sap-wood storage part in a liquid transport way, and the 3rd process which advances and carries out discharge of the plunger part, and if needed between the 2nd process and said 3rd process It is the discharge method of the sap-wood characterized by consisting of the 6th process which this 4th process makes the nozzle side sap-wood part a closed region including the 4th process which removes the air bubbles of sap-wood in a liquid transport way, and opens the nozzle side sap-wood part and the storage part side sap-wood part for free passage, and the 7th process which carries out advance movement of the plunger part.

[0018] Moreover, the sap-wood storage part in which this invention stores sap-wood and the nozzle part which carries out discharge of the sap-wood, The liquid transport way which opens said storage part and said nozzle part for free passage, and the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, [ said plunger part / it comes out with the plunger transportation device which carries out attitude movement, is constituted, and ] The discharge equipment of the sap-wood characterized by having the liquid transport way end of the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a liquid transport way near the nozzle side end of a liquid transport way for free passage, and said liquid transport way 2, or the liquid transport valve \*\*\*\* (ed) in the middle of liquid transport way 2 is made into the summary.

[0019] Moreover, the sap-wood storage part in which this invention stores sap-wood and the nozzle part which carries out discharge of the sap-wood, The liquid transport way which opens said storage part and said nozzle part for free passage, and the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, The plunger transportation device which carries out attitude movement of said plunger part, and the discharge valve \*\*\*\*(ed) in the middle of the nozzle side end of a liquid transport way, or the liquid transport way, it comes out with the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a discharge valve and a liquid transport way for

free passage, and is constituted, and the discharge equipment of the sap-wood characterized by said discharge valve taking the second position which opens for free passage the first position which opens a liquid transport way and a nozzle for free passage, and a liquid transport way and the liquid transport way 2 is made into the summary.

[0020] Furthermore, the sap-wood storage part in which this invention stores sap-wood again and the nozzle part which carries out discharge of the sap-wood, [ it comes out with the liquid transport way which opens said storage part and said nozzle part for free passage, and the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, is constituted, and / said plunger part ] It has the valve system intercepted or it opens said nozzle part and said storage part for free passage, The discharge equipment of the sap-wood preferably characterized by to have a discharge valve in the middle of said liquid transport way near the nozzle side end of said liquid transport way and the inside diameter of said liquid transport way and the inside diameter of said discharge valve considering it as the diameter of said substantially if needed is made into the summary.

[0021] The discharge equipment of the above-mentioned sap-wood of this invention more specifically [ said plunger part ] The plunger rod with which it has a tubular portion and said tubular portion has an outer wall side and the hole 1 open for free passage, The plunger head which it is equipped with at the tip of said plunger rod, has the tubular portion of said plunger rod, and the hole 2 open for free passage, and has the seal part stuck to an outer wall with the wall surface in a liquid transport way, it carries out being come out and constituted to the valve rod inserted in the tubular portion of said plunger rod, the valve rod drive means which makes said valve rod stick or estrange with said plunger head, a valve rod, and the valve drive means which carries out attitude operation of the valve rod with the feature. In that case, the 1st process which the discharge equipment of this sap-wood closes a discharge valve, and opens the valve rod inserted in the tubular portion of a plunger head and a plunger rod, The 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, Retreat movement of the plunger part is carried out, and discharge of the sap-wood is carried out according to the 2nd process which moves sap-wood to the nozzle side sap-wood part from the storage side sap-wood part, the 3rd process which opens a discharge valve and closes a valve rod, and the 4th process which advances a plunger part.

[0022]

[Mode for carrying out the invention] Advance operation of the inside of said plunger part liquid transport way is carried out, and sap-wood of the nozzle side sap-wood part is made to breathe out among the sap-wood divided by the nozzle side sap-wood part and the storage container side sap-wood part by the sliding surfaces of the plunger part which sticks to the inner wall surface of the liquid transport way which a nozzle and a sap-wood storage part open

for free passage, and slides on it. Here, since the amount of discharge of sap-wood is prescribed by the advance movement magnitude of a plunger part and the sliding surfaces of a plunger part are arranged in a channel in a plunger liquid transport way, a plunger part tip is always contacted to sap-wood.

[0023] Said plunger part preferably equipped with the valve system which opens for free passage or intercepts said nozzle side sap-wood part and said storage container side sap-wood part carries out advance operation of the inside of a liquid transport way for said valve system in the state of stoppage, and makes sap-wood breathe out. Since the plunger part is equipped with the valve system, channel branching is made unnecessary for sap-wood supply. At the time of discharge, pressurization for carrying out discharge of the sap-wood is not barred in particular by closing said valve system and making it march out.

[0024] Moreover, the tip of said plunger part consists of plunger heads arranged in the channel preferably, and said plunger head carries out advance movement in sap-wood. Since a plunger is arranged into a channel, the plunger head at the tip of a plunger part which pressurizes soon the sap-wood which carries out discharge is always located in sap-wood, and the peripheral face of said plunger head contacts sap-wood.

[0025] In the discharge method of the sap-wood which carries out advance movement and which a plunger part sticks a discharge process to the inner wall surface of a liquid transport way here, and carries out discharge By a blockade means, it resembles the 1st process which makes the nozzle side sap-wood part a closed region, the 2nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a liquid transport way, and the 3rd process which advances and carries out discharge of the plunger part, and is carried out more. Said 1st process includes preferably the 5th process which opens said nozzle side sap-wood part and the storage container side sap-wood part for free passage.

[0026] More preferably the air bubbles of sap-wood in a liquid transport way between said 2nd process and said 3rd process including the 4th process to remove still more preferably the 6th process which said 4th process makes a closed region said nozzle side sap-wood part by said blockade means, and opens said nozzle side sap-wood part and the storage part side sap-wood part for free passage, the 7th process which carries out advance movement of the plunger part, \*\* and others -- \*\*

[0027] As for said blockade means, it is desirable to consider it as a liquid transport way end or the discharge valve arranged in the middle of the liquid transport way. By making said discharge valve into a closed position, it can be considered as a blockade field, and said blockade means may blockade the discharge mouth at the tip of a nozzle. Specifically, it can blockade by the means of a cap etc. to a discharge mouth. Here, said 5th process has the desirable thing to depend on the valve system prepared in the plunger part and which is

performed.

[0028] In the valve system prepared in said plunger part The 21st process which closes a discharge valve and which reaches and opens a valve rod ([ process / which reaches and opens plunger valve system / which makes nozzle side sap-wood part closed space / 21st ]), The 22nd process which is made to carry out retreat operation of the plunger part, and supplies a liquid from a sap-wood storage part in a metering zone, It is desirable to carry out retreat movement of the plunger part, and to carry out discharge of the sap-wood according to the 23rd process which moves sap-wood to the nozzle side sap-wood part from the storage side sap-wood part, the 24th process which opens a discharge valve and closes a valve rod, and the 25th process which advances a plunger part.

[0029] The liquid transport way which opens for free passage the sap-wood storage part which stores sap-wood, the nozzle part which carries out discharge of the sap-wood, said storage part, and said nozzle, The plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, it comes out with the plunger transportation device which carries out attitude movement of said plunger part, is constituted, and has the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a liquid transport way near the nozzle side end of a liquid transport way for free passage, and the liquid transport way end of said liquid transport way 2 or the liquid transport valve \*\*\*\*(ed) in the middle of liquid transport way 2.

[0030] Unlike the conventional technology in which only a plunger pressurization side \*\*\*\*, a plunger part is \*\*\*\*(ed) by the sap-wood channel and is always \*\*\*\*(ed) by sap-wood. And since the wall surface in a liquid transport way on which a plunger slides is also always \*\*\*\*(ed), sap-wood does not dry and adhere in the plunger surface and the wall surface in a liquid transport way. Moreover, sap-wood leaks out unnecessarily from a plunger, and, originally adhesion of sap-wood to the part which is not desirable does not take place theoretically on an equipment configuration.

[0031] A liquid transport way is prepared between the sap-wood storage part in which sap-wood is stored, the nozzle which carries out discharge of the sap-wood, and \*\*, sap-wood is pressurized by the plunger which sticks to the inner wall surface of said liquid transport way, and slides on it, and discharge is carried out from a nozzle.

[0032] In order to supply sap-wood to a liquid transport way from a sap-wood storage part, it is necessary to seal the nozzle side sap-wood part located in the nozzle side among the sap-wood divided by a plunger. Even if the discharge valve is required for eye others and a discharge valve is not used for it, for example, it may cap at the tip of a nozzle and it may be made to seal it.

[0033] Moreover, the sap-wood storage part which stores sap-wood if it is in invention of discharge equipment and the nozzle part which carries out discharge of the sap-wood, The

liquid transport way which opens said storage part and said nozzle part for free passage, and the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, The liquid transport way end of the liquid transport way 2 which comes out, is constituted and opens the sap-wood storage part near the sap-wood storage part of a liquid transport way near the nozzle side end of a liquid transport way for free passage further, and said liquid transport way 2, or the liquid transport valve \*\*\*\*(ed) in the middle of liquid transport way 2, It is characterized by preparation \*\*\*\*\*, and the sap-wood divided by the sliding surfaces of the plunger part which sticks to a liquid transport way inside and slides on it is opened for free passage through a valve, and sap-wood supply on the liquid transport way 1 is enabled.

[0034]

[Function] The sap-wood storage part in which this invention stores sap-wood, and the nozzle part which carries out discharge of the sap-wood, The liquid transport way which opens said storage part and said nozzle for free passage, and the plunger part which has the seal part which sticks to the inside of said liquid transport way, and slides on it, it comes out with the plunger transportation device which carries out attitude movement of said plunger part, is constituted, and has the liquid transport way 2 which opens the sap-wood storage part near the sap-wood storage part of a liquid transport way near the nozzle side end of a liquid transport way for free passage, and the liquid transport way end of said liquid transport way 2 or the liquid transport valve \*\*\*\*(ed) in the middle of liquid transport way 2. Unlike the conventional technology in which only a plunger pressurization side \*\*\*\*, a plunger part is \*\*\*\*(ed) by the sap-wood channel and is always \*\*\*\*(ed) by sap-wood. And since the wall surface in a liquid transport way on which a plunger slides is also always \*\*\*\*(ed), sap-wood does not dry and adhere in the plunger surface and the wall surface in a liquid transport way. moreover, sap-wood from a plunger is unnecessary -- it leaks out and, originally adhesion of sap-wood to the part which is not desirable does not take place theoretically on an equipment configuration.

[0035] A liquid transport way is prepared between the sap-wood storage part in which sap-wood is stored, the nozzle which carries out discharge of the sap-wood, and \*\*, and this invention pressurizes sap-wood by the plunger which sticks to the inner wall surface of said liquid transport way, and slides on it, and carries out discharge from a nozzle. In order to supply sap-wood to a liquid transport way from a sap-wood storage part, it is necessary to seal the nozzle side sap-wood part located in the nozzle side among the sap-wood divided by a plunger. Even if the discharge valve is required for eye others and a discharge valve is not used for it, for example, it may cap at the tip of a nozzle and it may be made to seal it.

[0036] If the plunger which carries out rapid advance is stopped rapidly and big force of inertia is given to sap-wood, \*\*\*\*\* will be controlled by movement speed, migration length, etc. of a

plunger, and \*\*\*\* discharge of the sap-wood of the nozzle side sap-wood part will be carried out to a very small quantity. Moreover, when a plunger carries out advance operation quickly and stops advance operation quickly, force of inertia is given to sap-wood of the nozzle side sap-wood part, and discharge of the drop is carried out from a nozzle tip. This discharge operation repeats two or more rapid advance and rapid stops, and carries out discharge of the sap-wood of the nozzle side sap-wood part divided by one advance operation. In addition, it is also possible by adjusting the movement speed and migration length of a plunger to \*\*\*\* at once sap-wood of the nozzle side sap-wood part divided by one advance operation.

[0037] therefore -- in order to make sap-wood \*\*\*\* -- the acceleration of a plunger -- that is, A velocity differential is important, needs to move a plunger at high speed beforehand, and needs to carry out a quick stop after that. In order for a plunger to raise speed to a speed required in order to be controlled by the plunger drive means and to make sap-wood \*\*\*\*, acceleration migration length for a plunger to accelerate is needed.

[0038] Moreover, since the amount of \*\*\*\* discharge is dependent on the migration length of a plunger Since the speed of a plunger needed for \*\*\*\* cannot be obtained if the migration length of a plunger is short The many origin of a liquid transport way and a plunger is determined so that migration length sufficient in order that a plunger may obtain said speed may be acquired from the relation between the amount of \*\*\*\* discharge, and the movement speed of the suitable plunger for the sap-wood made to \*\*\*\*.

[0039] furthermore, in order to want to make the working range (migration length) of a plunger small in order to micrify \*\*\*\*\*, but to obtain the speed of the plunger for making it \*\*\*\* In order to fulfill simultaneously the opposite phenomenon of wanting to enlarge the working range (migration length) of a plunger By making a liquid transport way thin, securing the plunger movement magnitude from which the plunger speed for making it \*\*\*\* is obtained, and making a liquid transport way thin, even if a plunger moves greatly, let the amount of move volume, i.e., \*\*\*\*\* , be slight quantity.

[0040]

[Working example] Hereafter, although the work example of the invention in this application explains based on Drawings, the invention in this application is not limited at all by these work examples. In addition, the same mark is attached and explained to the same member in work examples 1-3.

[0041] The sap-wood storage part 1 in which the work example of work-example 1 this invention stores sap-wood as shown in drawing 1 , The liquid transport way 2 which opens for free passage the nozzle part 3 which carries out discharge of the sap-wood, and said storage part and said nozzle part 3, The plunger part 4 which has the seal part which sticks to the inside of said liquid transport way 2, and slides on it, It consists of a liquid transport way 6 which opens for free passage the plunger transportation device 5 which carries out attitude

movement of said plunger part 4, and the sap-wood storage part 1 and the neighborhood of the nozzle side end of the liquid transport way 2, a liquid transport valve 7 arranged in the middle of said liquid transport way 6, and a frame 9 which supports these each part.

[0042] The frame 9 consists of an up frame which supports the guidance rod which guides a plunger base material in the up-and-down direction, and the screw axis made to move a plunger base material in the up-and-down direction, and a support frame which supports the liquid container which constitutes the sap-wood storage part 1.

[0043] The sap-wood storage part 1 is the container formed at the cylindrical subject part which the upper part opened wide, and the form dished bottom, the liquid transport way terminal area is carrying out the opening to the bottom, and the liquid transport way 2 which coincided said container and the axis is connected in the axis. Therefore, a storage container will surround the liquid transport way 2, and a part of plunger part 4 is immersed in sap-wood in the container of the storage part 1 at the time of an operation. The liquid transport way 2 constitutes the sap-wood discharge pump from a plunger equipped with the seal part which the nozzle is equipped with the shape of a cylinder in the nothing lower end, and is stuck to the inner skin of the liquid transport way 2.

[0044] [ moreover, the sap-wood which it connects with halfway through the liquid transport valve 7, and sap-wood in the sap-wood storage part 1 was supplied to the sap-wood storage part 1 and the liquid transport way 2 by the liquid transport way 2 through the liquid transport valve 7, and was supplied to the liquid transport way 2 ] The seal of approval of the force of inertia is carried out by rapid advance and a rapid stop of a plunger, and it becomes a drop, and is breathed out from a nozzle.

[0045] Drawing 2 is shown and other work examples of this invention [ the discharge equipment of sap-wood of this work example ] The liquid transport way 2 which opens for free passage the sap-wood storage part 1 which stores sap-wood, the nozzle part 3 which carries out discharge of the sap-wood, and said storage part and said nozzle part 3, The plunger part 4 which has the seal part which sticks to the inside of said liquid transport way 2, and slides on it, The plunger transportation device 5 which carries out attitude movement of said plunger part 4, and the discharge valve 8 \*\*\*\*(ed) in the middle of nozzle side end [ of the liquid transport way 2 ], or liquid transport way 2, Consist of a liquid transport way 6 which opens about one sap-wood storage part or the sap-wood storage part 1 of the discharge valve 8 and the liquid transport way 2 for free passage, and a frame 9 which supports these each part, and [ said discharge valve 8 ] It is constituted in order to take the second position which opens for free passage the first position which opens the liquid transport way 2 and a nozzle for free passage, and the liquid transport way 2 and the liquid transport way 6.

[0046] Drawing 3 is shown further and other work examples of this invention [ the discharge equipment of sap-wood of this work example ] The liquid transport way 2 which opens for free

passage the sap-wood storage part 1 which stores sap-wood, the nozzle part 3 which carries out discharge of the sap-wood, and said storage part and said nozzle part 3, The plunger part 4 which has the seal part which sticks to the inside of said liquid transport way 2, and slides on it, Consist of a plunger transportation device 5 which carries out attitude movement of said plunger part 4, and a frame 9 which supports these each part, and [ said plunger part 4 ] It has the discharge valve 8 which has the channel of the inside diameter of the liquid transport way 2, and the diameter of said for the valve system intercepted or it opens said nozzle part 3 and said storage part for free passage near the nozzle side end of said liquid transport way 2 again.

[0047] Moreover, the cellular omission mechanism shown in drawing 4 is prepared in the plunger part 4 in this work example. The plunger rod 11 with which said plunger part 4 has a tubular portion, and said tubular portion has an outer wall side and the hole 13 to open for free passage, The plunger head 12 which it is equipped with at the tip of said plunger rod 11, has the tubular portion of said plunger rod 11, and the cellular omission hole 14 open for free passage, and has the seal part 13 stuck to an outer wall with the inner wall surface of the total liquid transport way 2, The valve rod 16 inserted in the tubular portion of said plunger rod 11, It has the cellular omission mechanism which consisted of [ hole / 14 / of said plunger head 12 / cellular / omission ] air cylinders 17 as a valve rod drive means made to open or close in said valve rod 16. When said air cylinder 17 is operated and a valve rod 16 is retreated, [ said valve rod 16 ] Move in the length direction of the plunger rod 11, and the tip part of a valve rod 16 opens wide the cellular omission hole 14 which separated from the plunger head 12 and was prepared in the plunger head 12. It is open for free passage with the external world through the opening between this cellular omission hole 14, the plunger rod 11, and a valve rod 16, advance movement of the plunger part 4 is carried out, and air bubbles are discharged to the exterior ahead of the plunger head 12.

[0048] in addition -- the above-mentioned cellular omission mechanism is applicable also to a work example 1 and a work example 2 -- moreover, movement of a valve rod -- \*\*\*\*\* -- it is also possible to use a screw like.

[0049]

[Effect of the Invention] Thus, since the liquid transport way inside the sliding surfaces of a plunger and said plunger \*\*\*\* touches sap-wood according to the invention concerned, Since the liquid transport way inside the sliding surfaces of said plunger and said plunger \*\*\*\* does not dry and adhere, the increase in the unnecessary sliding resistance in plunger movement resulting from these can be prevented effectively, and, as for accuracy, discharge, dropping, and \*\*\*\* can improve sap-wood.

[0050] moreover -- it becomes possible, since the equipment configuration which makes unnecessary piping branching for sap-wood supply on the liquid transport way pressurized is

also possible to pressurize necessary minimum sap-wood efficiently -- therefore, sap-wood -- accuracy -- good -- discharge -- it can drop and \*\*\*\*.

[0051] In the work which removes the air bubbles mixed in sap-wood, since the sap-wood which is mixed with a cellular group and discharged is made recyclable, removing air bubbles effectively, it is possible not to make useless the sap-wood discharged at the time of cellular removal at all, but to use it effective in discharge, dropping, and \*\*\*\*.

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[Brief Description of the Drawings]

[Drawing 1] It is the key map showing one work example of this invention, and (a) is a front view and (b) is a side view.

[Drawing 2] It is the key map showing other work examples, and (a) is a front view and (b) is a side view.

[Drawing 3] Furthermore, it is the key map showing other work examples, and (a) is a front view and (b) is a side view.

[Drawing 4] It is the important section sectional view of the work example shown in drawing 3 .

[Explanations of letters or numerals]

1 Sap-wood Storage Part

2 Liquid Transport Way

3 Nozzle Part

4 Plunger Part

5 Plunger Transportation Device (Motor)

6 Liquid Transport Way

7 Liquid Transport Valve

8 Discharge Valve

9 Frame

10 Storage Container

11 Plunger Rod

12 Plunger Head

13 Seal Part

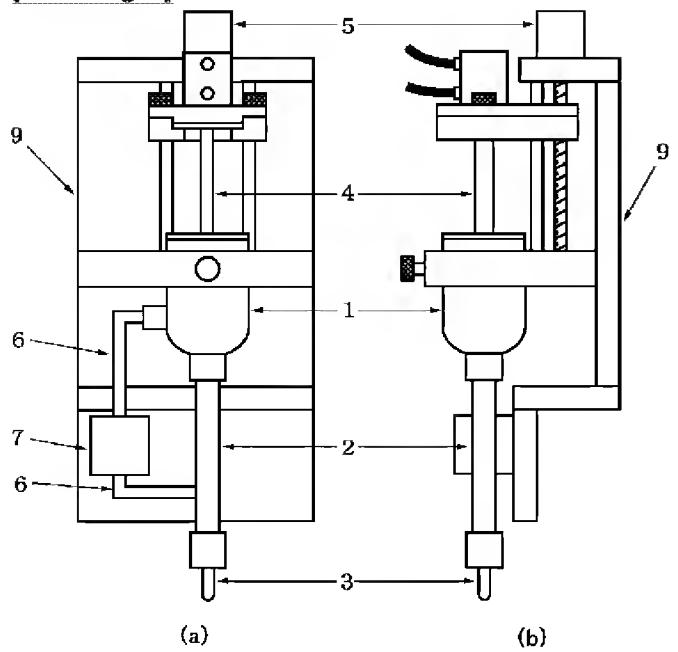
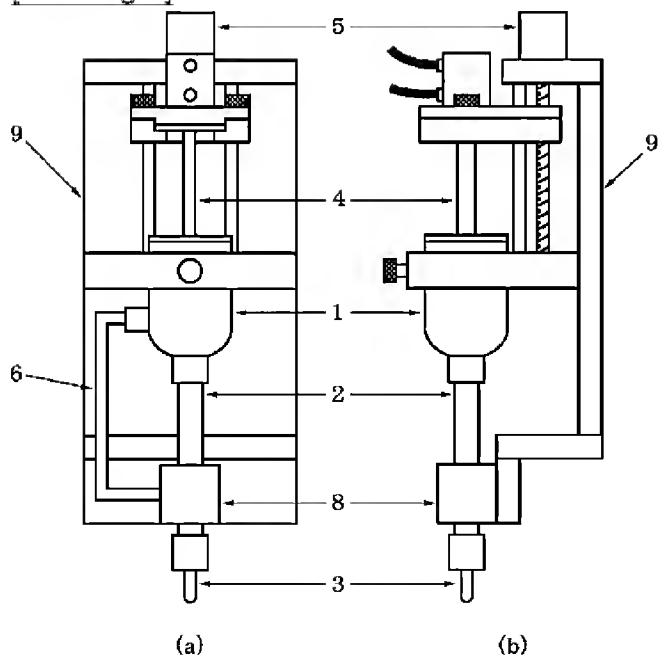
14 Cellular Omission Hole

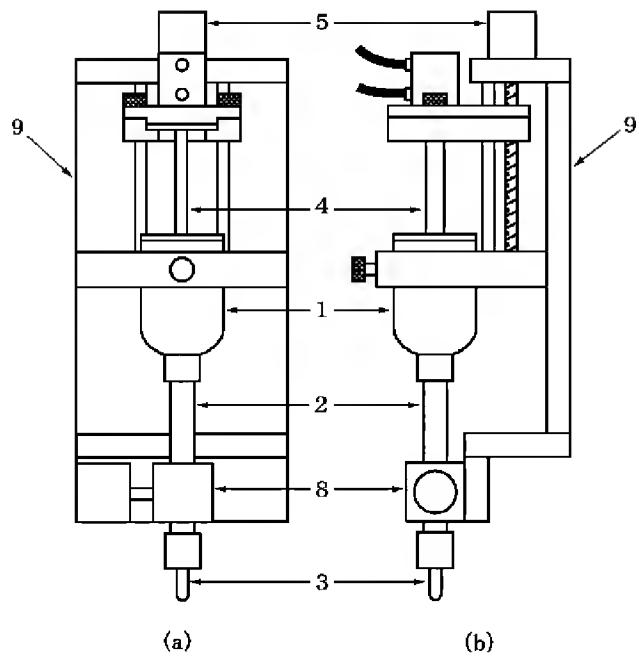
15 Hole

16 Valve Rod

17 Valve Rod Drive Means (Air Cylinder)

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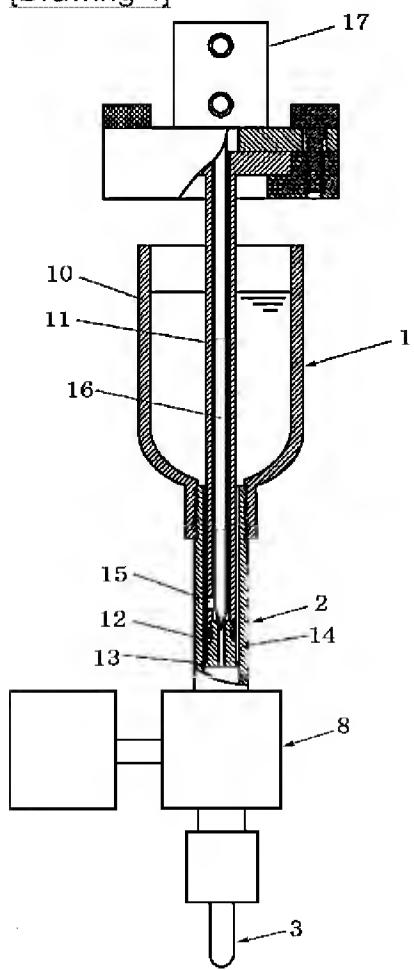
[Drawing 1][Drawing 2][Drawing 3]



(a)

(b)

[Drawing 4]



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[Translation done.]

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(71)出願人 390026387

武蔵エンジニアリング株式会社  
東京都三鷹市井口1丁目11番6号

(72)発明者 生島 和正

東京都三鷹市井口1-11-6 武蔵エンジニアリング株式会社内

(74)代理人 100102314

弁理士 須藤 阿佐子 (外1名)

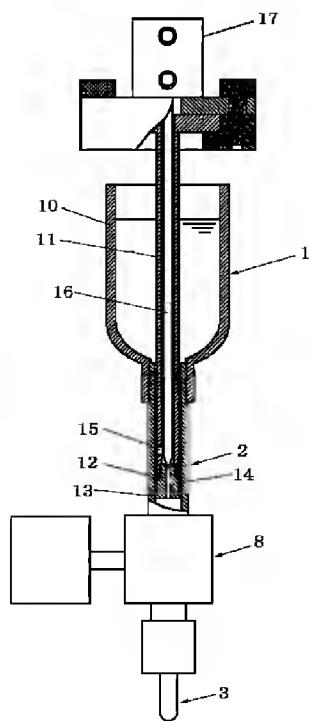
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(54)【発明の名称】 液材の吐出方法およびその装置

(57)【要約】

【課題】 精度良く吐出、滴下、飛滴する方法及び装置を提供すること。

【解決手段】 ノズルと貯留部とを連通する液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する液材の吐出方法。液材で満たされる空間の途中にプランジャーを配設する。液送路の内壁面に密着して摺動するプランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー一部が液送路内を進出動作して吐出させる。液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、で構成され、液送路のノズル側末端近傍と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備えることを特徴とする液材の吐出装置。



## 【特許請求の範囲】

【請求項1】 ノズルと貯留部とを連通する液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する液材の吐出方法。

【請求項2】 液材で満たされる空間の途中にプランジャーを配設する請求項1の液材の吐出方法。

【請求項3】 液送路の内壁面に密着して摺動するプランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させる請求項1または2の液材の吐出方法。

【請求項4】 プランジャー部が、ノズル側液材部と貯留容器側液材部とを連通する、または遮断する弁機構を備え、弁機構を閉止状態にて液送路内を進出動作して液材を吐出させる請求項3の液材の吐出方法。

【請求項5】 プランジャー部の先端が流路内に配置されたプランジャーへッドで構成され、プランジャーへッドが液材中で進出移動して液材を吐出する請求項3または4の液材の吐出方法。

【請求項6】 ノズル側液材部を閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程とからなる請求項3、4または5の液材の吐出方法。

【請求項7】 第1の工程は、ノズル側液材部と貯留部側液材部を連通する第5の工程を含む請求項6の液材の吐出方法。

【請求項8】 第2の工程と前記第3の工程との間に、液送路内の液材の気泡を除去する第4の工程を含む請求項6または7の液材の吐出方法。

【請求項9】 第4の工程は、ノズル側液材部を閉領域とし、かつ、ノズル側液材部と貯留部側液材部とを連通する第6の工程と、プランジャー部を前進移動する第7の工程とからなる請求項8の液材の吐出方法。

【請求項10】 液送路末端、または液送路途中に配設された吐出バルブを閉塞手段とする請求項6ないし9のいずれかの液材の吐出方法。

【請求項11】 閉塞手段は、ノズル先端の吐出口を閉塞する請求項10の液材の吐出方法。

【請求項12】 第5の工程は、プランジャー部に設けられた弁機構による請求項7ないし11のいずれかの液材の吐出方法。

【請求項13】 液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、で構成され、液送路のノズル側末端近傍と液送路の液材貯留部近傍ま

たは液材貯留部とを連通する液送路2と前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備えることを特徴とする液材の吐出装置。

【請求項14】 液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、

液送路のノズル側末端または液送路途中に配接された吐出弁と、吐出弁と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と、で構成され、前記吐出弁は、液送路とノズルとを連通する第一の位置と、液送路と液送路2とを連通する第二の位置と、を取ることを特徴とする液材の吐出装置。

【請求項15】 液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、で構成され、前記プランジャー部は、前記ノズル部と前記貯留部とを連通するまたは遮断する弁機構を備えることを特徴とする液材の吐出装置。

【請求項16】 前記液送路のノズル側末端近傍、または前記液送路途中に、吐出弁を備えることを特徴とする請求項15の液材の吐出装置。

【請求項17】 前記液送路の内径と前記吐出弁の内径とが実質的に同径とすることを特徴とする請求項15または16の液体吐出装置。

【請求項18】 前記プランジャー部は、管状部を有し、前記管状部は外壁面と連通する孔1を有するプランジャーロッドと、前記プランジャーロッドの先端に装着され、前記プランジャーロッドの管状部と連通する孔2を有し、外壁に液送路内壁面と密着するシール部を有する、プランジャーへッドと、前記プランジャーロッドの管状部に挿入されるバルブロッドと、前記バルブロッドを前記プランジャーへッドと密着または離間させるバルブロッド駆動手段と、バルブロッドと、バルブロッドを進退動作させるバルブ駆動手段と、で構成されることを特徴とする請求項15ないし17のいずれかの液材の吐出装置。

【請求項19】 吐出バルブを閉じる、及びプランジャーへッドとプランジャーロッドの管状部に挿入されるバルブロッドを開く第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を後退移動させて、貯留側液材部からノズル側液材部に液材を移動する第2の工程と、

吐出バルブを開き、バルブロッドを閉じる第3の工程と、  
プランジャー部を前進させる第4の工程とにより、液材  
を吐出する請求項18の液材の吐出装置。

## 【発明の詳細な説明】

## 【0001】

【産業の属する技術分野】本発明は、液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する分野に関し、液材の液送路内面における不要な乾燥固着、およびプランジャーからの液材の不要な漏出を防止し、また、プランジャーを配接して液材を加圧する体積を少なくして精度良く吐出し、さらに、液材内の気泡除去作業における液材の損失を無くして液材を効率良く使用する液材の吐出方法および装置に関する。ここで、吐出とは、液材を吐出、滴下、飛滴させることである。

## 【0002】

【従来の技術】液材を飛滴する技術としては、後退動作および進退動作を行うプランジャーを用い、急速前進するプランジャーを弁座に当接させることにより急激に停止させ、プランジャーの前方に位置する液材に慣性力を印可し、この慣性力により液材を飛滴する技術が知られているが、この技術では、液材を飛滴させるために必要な慣性力を、停止する固体の弁座と運動する固体のプランジャーを当接させて、プランジャーの運動を瞬時に停止して得るために、プランジャーおよび弁座の損傷が激しく、また損傷した部材片が液材に混入・溶解してしまうという問題があった。

【0003】そこで、本出願人は、上記問題を解決すべく、液材吐出用プランジャーの先端面を液材に密接させた後、プランジャーを高速前進させ、次いでプランジャー駆動手段を急激に停止させることにより、急速前進するプランジャーを弁座に当接せざることなく急激に停止させ、プランジャーの前方に位置する液材に慣性力を印加し、この慣性力により液材を飛滴する技術を提案した(特願2001-319074号)。

## 【0004】

【発明が解決しようとする課題】上記先願の発明は、所期の目的は達成できたが、同発明を実施する段階で以下のような問題が生じた。

【0005】プランジャーの進退移動動作を繰り返すと、プランジャーのシール部から少しづつ染み出した液材が、計量部内壁面で乾燥・固着し、プランジャーの摺動円滑性を妨げることとなり、吐出の定量性が損なわれるばかりか、シール部から液材が漏出してしまい、ついには液材が吐出されなくなることがある。

【0006】また、前記装置においては、液材が、液材を貯留する貯留容器から、液材供給バルブを介して、計量管に流入する経路を辿るために、プランジャーの進出動作により、計量管から液材供給バルブに至る液材も加

圧され、急峻な圧力上昇を望む吐出システムにおいては、不要な液材占有空間が広がることとなり、急峻な圧力上昇を妨げる要因となる。

【0007】さらに、前記装置においては、気泡抜きをプランジャーロッドに設けられた排出孔から外気に向かって、排出した気体を放出するために、気泡群に混ざって液体が排出されることがあり、従来はこれをウェス等の手段により拭き取らなければならない。

【0008】このため、プランジャー部材に液材が付着するため装置が汚れ、さらには僅かな量ではあるが液体が無駄になっていた。特に高価な液体は、この僅かな量でも無駄にはできないのであるが、気泡が定量吐出に及ぼす影響を考慮すると、すなわち気泡が混入した液体では定量吐出が望めないため、高価な液体を無駄にしてでも気泡を排出せざるを得なかった。また、飛滴させる場合には、気泡のために飛滴されないことがある。

【0009】そこで、本発明は、かかる問題を解決し、精度良く吐出、滴下、飛滴する方法及び装置を提供することを課題とし、また、液材内に混入する気泡を効果的に排出し、さらに気泡除去作業時に気泡群に混じって排出される液材を全く無駄にせず、吐出、滴下、飛滴に利用を可能とする、液体の吐出方法、及び装置を提供することを課題とする。

## 【0010】

【課題を解決するための手段】本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する液材の吐出方法を要旨としている。

【0011】液材で満たされる空間の途中にプランジャーを配設しており、その場合、本発明は、液材で満たされる空間の途中に配設された、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する液材の吐出方法である。

【0012】液送路の内壁面に密着して摺動するプランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させており、その場合、本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動する、

好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させることを特徴とする液材の吐出方法である。

【0013】プランジャー部が、ノズル側液材部と貯留容器側液材部とを連通する、または遮断する弁機構を備え、弁機構を閉止状態にて液送路内を進出動作して液材を吐出させており、その場合、本発明は、ノズルと貯留

部とを連通する液送路の内壁面に密着して摺動する、好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を、ノズル側液材部と貯留容器側液材部とを連通するまたは遮断する弁機構を備えたプランジャー部が、弁機構を閉止状態にて、液送路内を進出動作して吐出させることを特徴とする液材の吐出方法である。

【0014】プランジャー部の先端が流路内に配置されたプランジャーへッドで構成され、プランジャーへッドが液材中で進出移動して液材を吐出しており、その場合、本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動する、好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を、先端が流路内に配置されたプランジャーへッドで構成されるプランジャー部が、そのプランジャーへッドを液材中で進出移動して吐出させることを特徴とする液材の吐出方法である。

【0015】ノズル側液材部を閉領域とする、このましくは液送路末端、または液送路途中に配設された吐出バルブにより閉領域とする、より好ましくはノズル先端の吐出口を閉塞する閉塞手段により閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程とからなり、その場合、本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動する、好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させる方法であって、ノズル側液材部を閉領域とする、このましくは液送路末端、または液送路途中に配設された吐出バルブにより閉領域とする、より好ましくはノズル先端の吐出口を閉塞する閉塞手段により閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程とからなることを特徴とする液材の吐出方法である。

【0016】第1の工程は、ノズル側液材部と貯留部側液材部を連通する第5の工程を含んでおり、好ましくは第5の工程は、プランジャー部に設けられた弁機構によるものであり、必要に応じ第2の工程と前記第3の工程との間に、液送路内の液材の気泡を除去する第4の工程を含んでおり、その場合、本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動する、好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側

液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させる方法であって、ノズル側液材部と貯留部側液材部を連通する第5の工程を含む、好ましくはプランジャー部に設けられた弁機構による第5の工程を含む、ノズル側液材部を閉領域とする、このましくは液送路末端、または液送路途中に配設された吐出バルブにより閉領域とする、より好ましくはノズル先端の吐出口を閉塞する閉塞手段により閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程とからなり、必要に応じ第2の工程と前記第3の工程との間に、液送路内の液材の気泡を除去する第4の工程を含むことを特徴とする液材の吐出方法である。

【0017】第4の工程は、ノズル側液材部を開領域とし、かつ、ノズル側液材部と貯留部側液材部とを連通する第6の工程と、プランジャー部を前進移動する第7の工程とからなり、その場合、本発明は、ノズルと貯留部とを連通する液送路の内壁面に密着して摺動する、好ましくは液材で満たされる空間の途中に配設された、プランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断し、分断された液体のうち、ノズル側液材部の液材を前記プランジャー部が液送路内を進出動作して吐出させる方法であって、ノズル側液材部と貯留部側液材部を連通する第5の工程を含む、好ましくはプランジャー部に設けられた弁機構による第5の工程を含む、ノズル側液材部を閉領域とする、このましくは液送路末端、または液送路途中に配設された吐出バルブにより閉領域とする、より好ましくはノズル先端の吐出口を閉塞する閉塞手段により閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程とからなり、必要に応じ第2の工程と前記第3の工程との間に、液送路内の液材の気泡を除去する第4の工程を含み、該第4の工程は、ノズル側液材部を開領域とし、かつ、ノズル側液材部と貯留部側液材部とを連通する第6の工程と、プランジャー部を前進移動する第7の工程とからなることを特徴とする液材の吐出方法である。

【0018】また、本発明は、液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、で構成され、液送路のノズル側末端近傍と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備えることを特徴とする液材の吐出装置を要旨としている。

【0019】また、本発明は、液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、液送路のノズル側末端または液送路途中に配接された吐出弁と、吐出弁と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と、で構成され、前記吐出弁は、液送路とノズルとを連通する第一の位置と、液送路と液送路2とを連通する第二の位置と、を取ることを特徴とする液材の吐出装置を要旨としている。

【0020】さらにまた、本発明は、液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、で構成され、前記プランジャー部は、前記ノズル部と前記貯留部とを連通するまたは遮断する弁機構を備えること、好ましくは前記液送路のノズル側末端近傍、または前記液送路途中に、吐出弁を備えること、必要に応じ前記液送路の内径と前記吐出弁の内径とが実質的に同径とすることを特徴とする液材の吐出装置を要旨としている。

【0021】本発明の上記の液材の吐出装置は、より具体的には前記プランジャー部は、管状部を有し、前記管状部は外壁面と連通する孔1を有するプランジャーロッドと、前記プランジャーロッドの先端に装着され、前記プランジャーロッドの管状部と連通する孔2を有し、外壁に液送路内壁面と密着するシール部を有する、プランジャーへッドと、前記プランジャーロッドの管状部に挿入されるバルブロッドと、前記バルブロッドを前記プランジャーへッドと密着または離間させるバルブロッド駆動手段と、バルブロッドと、バルブロッドを進退動作させるバルブ駆動手段と、で構成されることを特徴とする。その場合、該液材の吐出装置は、吐出バルブを閉じる、及びプランジャーへッドとプランジャーロッドの管状部に挿入されるバルブロッドを開く第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を後退移動させて、貯留側液材部からノズル側液材部に液材を移動する第3の工程と、吐出バルブを開き、バルブロッドを閉じる第4の工程と、プランジャー部を前進させる第5の工程とにより、液材を吐出する。

## 【0022】

【発明の実施の形態】ノズルと液材貯留部とが連通する液送路の内壁面に密着して摺動するプランジャー部の摺動面により、ノズル側液材部と貯留容器側液材部とに分断される液材のうち、ノズル側液材部の液材を前記プランジャー部液送路内を進出動作して吐出させる。ここで、液材の吐出量は、プランジャー部の進出移動量により規定され、プランジャー液送路は、プランジャー部の

摺動面が流路中に配置されるため、プランジャー部先端は常に液材に接触させる。

【0023】好ましくは、前記ノズル側液材部と前記貯留容器側液材部とを連通する、または遮断する弁機構を備える前記プランジャー部が、前記弁機構を閉止状態にて液送路内を進出動作して液材を吐出させる。プランジャー部に弁機構を備えているため、液材供給のために流路分岐を不要とする。特に、吐出時には、前記弁機構を閉じて進出させることにより、液材を吐出するための加圧を妨げない。

【0024】また、好ましくは前記プランジャー部の先端が流路内に配設されたプランジャーへッドで構成され、前記プランジャーへッドが液材中で進出移動する。吐出する液材を直に加圧する、プランジャー部先端のプランジャーへッドは、プランジャーが流路中に配設されるために、常に液材中に位置し、前記プランジャーへッドの外周面は液材に接触する。

【0025】ここで、吐出工程は、プランジャー部が液送路の内壁面に密着して進出移動して吐出する液材の吐出方法において、閉塞手段により、ノズル側液材部を閉領域とする第1の工程と、プランジャー部を後退動作させて、液送路内に液材貯留部より液体を供給する第2の工程と、プランジャー部を前進して吐出する第3の工程と、により行われる。好ましくは、前記第1の工程は、前記ノズル側液材部と貯留容器側液材部を連通する第5の工程を含む。

【0026】より好ましくは、前記第2の工程と前記第3の工程との間に、液送路内の液材の気泡を除去する第4の工程を含み、さらに好ましくは、前記第4の工程は、前記閉塞手段により前記ノズル側液材部を閉領域とし、かつ前記ノズル側液材部と貯留部側液材部とを連通する第6の工程と、プランジャー部を前進移動する第7の工程と、からなる。

【0027】前記閉塞手段は、液送路末端、または液送路途中に配設された吐出バルブとすることが好ましい。前記吐出バルブを閉位置とすることで、閉塞領域とができる、また、前記閉塞手段は、ノズル先端の吐出口を閉塞しても良い。具体的には、吐出口にキャップ等の手段により閉塞することができる。ここで、前記第5の工程は、プランジャー部に設けられた弁機構による行われることが好ましい。

【0028】前記プランジャー部に設けられた弁機構においては、吐出バルブを閉じる及びバルブロッドを開く第21の工程と、(ノズル側液材部を開空間とする及びプランジャー弁機構を開く第21の工程と)、プランジャー部を後退動作させて、計量部内に液材貯留部より液体を供給する第22の工程と、プランジャー部を後退移動させて、貯留側液材部からノズル側液材部に液材を移動する第23の工程と、吐出バルブを開き、バルブロッドを閉じる第24の工程と、プランジャー部を前進さ

せる第25の工程とにより、液材を吐出することが好ましい。

【0029】液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズルとを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、で構成され、液送路のノズル側末端近傍と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と、前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備える。

【0030】プランジャー加圧面のみが接液する従来技術とは異なり、プランジャー部が液材流路に配接されて常時液材に浸漬されており、かつプランジャーが摺動する液送路内壁面も常時接液していることから、液材が、プランジャー表面、および液送路内壁面において乾燥および固着することが無い。また、プランジャーから液材が不要に漏出して、本来、接液が好ましくない箇所への液材の付着が、装置構成上、原理的に起こらない。

【0031】液材が貯留される液材貯留部と、液材を吐出するノズルと、の間に液送路が設けられ、前記液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する。

【0032】液材を液材貯留部から液送路へ供給するためには、プランジャーで分断される液材のうちノズル側に位置するノズル側液材部を、密閉する必要がある。吐出バルブは、そのために必要であり、吐出バルブを用いなくとも、例えばノズル先端にキャップして密閉させても良い。

【0033】また、吐出装置の発明にあっては、液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズル部とを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、で構成され、さらに、液送路のノズル側末端近傍と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備えることを特徴とし、液送路内面に密着して摺動するプランジャー部の摺動面により分断される液材を、バルブを介して連通し、液送路1への液材供給を可能とする。

#### 【0034】

【作用】本発明は、液材を貯留する液材貯留部と、液材を吐出するノズル部と、前記貯留部と前記ノズルとを連通する液送路と、前記液送路の内面に密着して摺動するシール部を有するプランジャー部と、前記プランジャー部を進退移動するプランジャー移動手段と、で構成され、液送路のノズル側末端近傍と液送路の液材貯留部近傍または液材貯留部とを連通する液送路2と、前記液送路2の液送路末端、または液送路2途中に配接された液送弁と、を備える。プランジャー加圧面のみが接液する

従来技術とは異なり、プランジャー部が液材流路に配接されて常時液材に浸漬されており、かつプランジャーが摺動する液送路内壁面も常時接液していることから、液材が、プランジャー表面、および液送路内壁面において乾燥および固着することが無い。また、プランジャーからの液材の不要な漏出して、本来、接液が好ましくない箇所への液材の付着が、装置構成上、原理的に起こらない。

【0035】本発明は、液材が貯留される液材貯留部と、液材を吐出するノズルと、の間に液送路が設けられ、前記液送路の内壁面に密着して摺動するプランジャーで液材を加圧してノズルより吐出する。液材を液材貯留部から液送路へ供給するためには、プランジャーで分断される液材のうちノズル側に位置するノズル側液材部を、密閉する必要がある。吐出バルブは、そのために必要であり、吐出バルブを用いなくとも、例えばノズル先端にキャップして密閉させても良い。

【0036】急速前進するプランジャーを急激に停止させ液材に大きな慣性力を与えると、ノズル側液材部の液材は、プランジャーの移動速度および移動距離等により飛滴量が制御されて、微量に飛滴吐出する。また、プランジャーが急速に進出動作し、急速に進出動作を停止することにより、ノズル側液材部の液材に慣性力を与え、ノズル先端より液滴を吐出する。この吐出作動は、1回の進出作動により分断されたノズル側液材部の液材を、複数回の急速前進・急速停止を繰り返して吐出する。なお、プランジャーの移動速度および移動距離を調整することにより、1回の進出作動により分断されたノズル側液材部の液材を1回で飛滴することも可能である。

【0037】したがって、液材を飛滴させるためには、プランジャーの加速度、すなわち、速度差が重要であり、予めプランジャーを高速に移動させ、その後急停止させる必要があり、プランジャーはプランジャー駆動手段により制御されており、液材を飛滴させるために必要な速度まで速度を向上させるためには、プランジャーが加速するための加速移動距離が必要となる。

【0038】また、飛滴吐出量がプランジャーの移動距離に依存されているので、プランジャーの移動距離が短いと、飛滴に必要とするプランジャーの速度を得ることができないので、飛滴吐出量と、飛滴させる液材に適切なプランジャーの移動速度との関係から、プランジャーが前記速度を得るために充分な移動距離が得られるように、液送路およびプランジャーの諸元を決定する。

【0039】さらに、飛滴量を微小化するためには、プランジャーの動作範囲（移動距離）を小さくしたいが、飛滴させるためのプランジャーの速度を得るために、プランジャーの動作範囲（移動距離）は大きくしたいという相反する事象を同時に満たすために、液送路を細くして、飛滴させるためのプランジャー速度が得られるプランジャー移動量を確保し、液送路を細くすることによ

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り、プランジャーが大きく移動しても移動体積量、即ち飛滴量を微少量とする。

【0040】

【実施例】以下、図面にもとづいて本願発明の実施例で説明するが、本願発明はこれら実施例によって何ら限定されるものではない。なお、実施例1～3において同一部材には同一符号を付して説明する。

【0041】実施例1本発明の実施例は、図1に示すように、液材を貯留する液材貯留部1と、液材を吐出するノズル部3と、前記貯留部と前記ノズル部3とを連通する液送路2と、前記液送路2の内面に密着して摺動するシール部を有するプランジャー部4と、前記プランジャー部4を進退移動するプランジャー移動手段5と、それら各部を支持する枠体9とで構成されており、前記プランジャー部4は、前記ノズル部3と前記貯留部とを連通するまたは遮断する弁機構を、また、前記液送路2のノズル側末端近傍に、液送路2の内径と同径の流路を有する吐出弁8を備えている。

【0042】枠体9は、プランジャー支持体を上下方向に案内する案内ロッドと、プランジャー支持体を上下方向に移動させるネジ軸とを支持する上部枠体と、液材貯留部1を構成する液体容器を支持する支持枠体とで構成されている。

【0043】液材貯留部1は、上部が開放した円筒状主体部と皿状底部で形成された容器であり、底部には液送路接続部が開口しており、軸芯を前記容器と軸芯を一致させた液送路2が接続されている。したがって、貯留容器は液送路2を囲繞することになり、作動時プランジャー部4の一部は貯留部1の容器内の液材に浸漬されている。液送路2は円筒状をなし下端にノズルが装着されており、また、液送路2の内周面に密着するシール部を備えたプランジャーとで液材吐出ポンプを構成している。

【0044】また、液材貯留部1と液送路2とは、中途に液送弁7を介して接続されており、液材貯留部1内の液材を液送弁7を介して液送路2に供給され、液送路2に供給された液材は、プランジャーの急速前進及び急速停止により慣性力が印可されて、液滴となってノズルより吐出される。

【0045】図2は、本発明の他の実施例を示し、この実施例の液材の吐出装置は、液材を貯留する液材貯留部1と、液材を吐出するノズル部3と、前記貯留部と前記ノズル部3とを連通する液送路2と、前記液送路2の内面に密着して摺動するシール部を有するプランジャー部4と、前記プランジャー部4を進退移動するプランジャー移動手段5と、液送路2のノズル側末端または液送路2途中に配設された吐出弁8と、吐出弁8と液送路2の液材貯留部1近傍または液材貯留部1とを連通する液送路6と、それら各部を支持する枠体9とで構成されており、前記吐出弁8は、液送路2とノズルとを連通する第一の位置と、液送路2と液送路6とを連通する第二の位置と、を取るべく構成されている。

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【0046】図3は、さらに本発明の他の実施例を示し、この実施例の液材の吐出装置は、液材を貯留する液材貯留部1と、液材を吐出するノズル部3と、前記貯留部と前記ノズル部3とを連通する液送路2と、前記液送路2の内面に密着して摺動するシール部を有するプランジャー部4と、前記プランジャー部4を進退移動するプランジャー移動手段5と、それら各部を支持する枠体9とで構成されており、前記プランジャー部4は、前記ノズル部3と前記貯留部とを連通するまたは遮断する弁機構を、また、前記液送路2のノズル側末端近傍に、液送路2の内径と同径の流路を有する吐出弁8を備えている。

【0047】また、この実施例におけるプランジャー部4には、図4に示す気泡抜き機構が設けられている。前記プランジャー部4は、管状部を有し、前記管状部は外壁面と連通する孔13を有するプランジャーロッド11と、前記プランジャーロッド11の先端に装着され、前記プランジャーロッド11の管状部と連通する気泡抜き孔14を有し、外壁に計液送路2の内壁面と密着するシール部13を有するプランジャーへッド12と、前記プランジャーロッド11の管状部に挿入されるバルブロッド16と、前記バルブロッド16を前記プランジャーへッド12の気泡抜き孔14を開放または閉鎖させるバルブロッド駆動手段としてのエアシリンダー17とで構成された気泡抜き機構を備えており、前記エアシリンダー17を作動させてバルブロッド16を後退させると、前記バルブロッド16は、プランジャーロッド11の長さ方向に移動し、バルブロッド16の先端部はプランジャーへッド12から離れてプランジャーへッド12に設けた気泡抜き孔14を開放し、該気泡抜き孔14、プランジャーへッド12とバルブロッド16との間の空隙を介して外界と連通し、プランジャー部4を進出移動させてプランジャーへッド12の前方に気泡を外部へ排出する。

【0048】なお、上記気泡抜き機構は、実施例1及び実施例2にも適用でき、また、バルブロッドの移動は、先願のようにネジを用いることも可能である。

【0049】

【発明の効果】このように、当該発明によると、プランジャーの摺動面および前記プランジャーが摺接する液送路内面が、常に液材に接触しているため、前記プランジャーの摺動面および前記プランジャーが摺接する液送路内面が乾燥および固着することが無いから、これらに起因するプランジャー移動における不要な摺動抵抗の増加を効果的に防止して、精度良く液材を吐出・滴下・飛滴することができる。

【0050】また、加圧される液送路に液材供給のための配管分岐を不要とする装置構成も可能であるから、必要最小限の液材を効率良く加圧することが可能となり、従って、液材を精度良く吐出、滴下、飛滴することができる。

【0051】液材内に混入する気泡を除去する作業においては、効果的に気泡を除去しつつ、気泡群に混じって排出される液材を再利用可能とするから、気泡除去時に排出される液材を全く無駄にせず、吐出、滴下、飛滴に有効に利用することが可能である。

【図面の簡単な説明】

【図1】 本発明の1実施例を示す概念図であり、(a)は正面図、(b)は側面図である。

【図2】 他の実施例を示す概念図であり、(a)は正面図、(b)は側面図である。

【図3】 さらに他の実施例を示す概念図であり、(a)は正面図、(b)は側面図である。

【図4】 図3に示す実施例の要部断面図である。

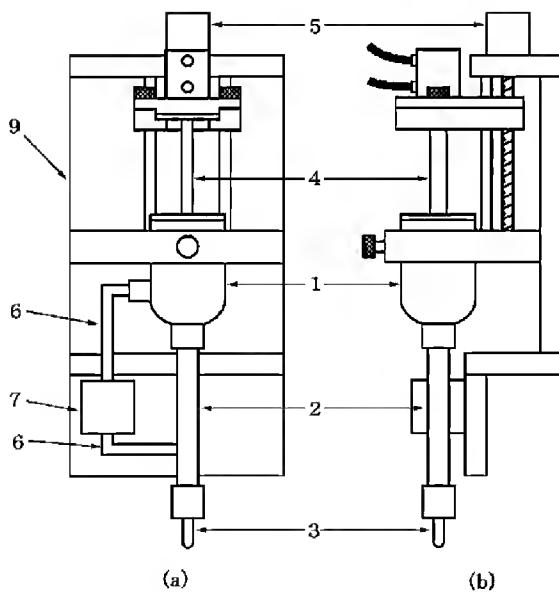
【符号の説明】

- 1 液材貯留部
- 2 液送路

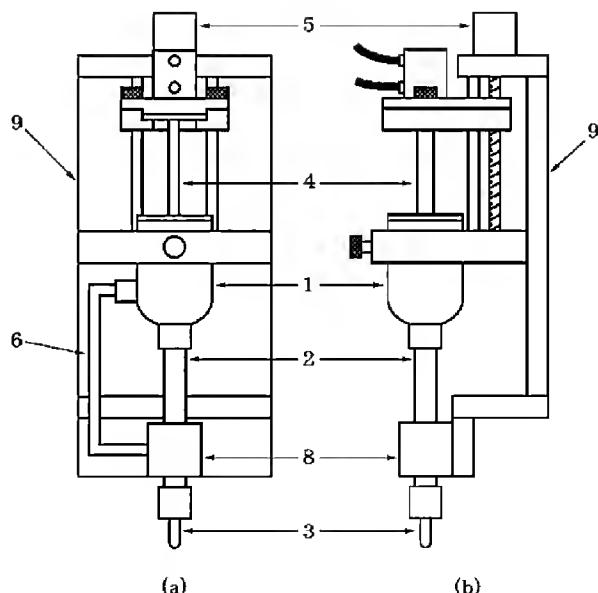
- \* 3 ノズル部
- 4 プランジャー部
- 5 プランジャー移動手段(モータ)
- 6 液送路
- 7 液送弁
- 8 吐出弁
- 9 枠体
- 10 貯留容器
- 11 プランジャーーロッド
- 12 プランジャーーヘッド
- 13 シール部
- 14 気泡抜き孔
- 15 孔
- 16 バルブロッド
- 17 バルブロッド駆動手段(エアシリンダー)

\*

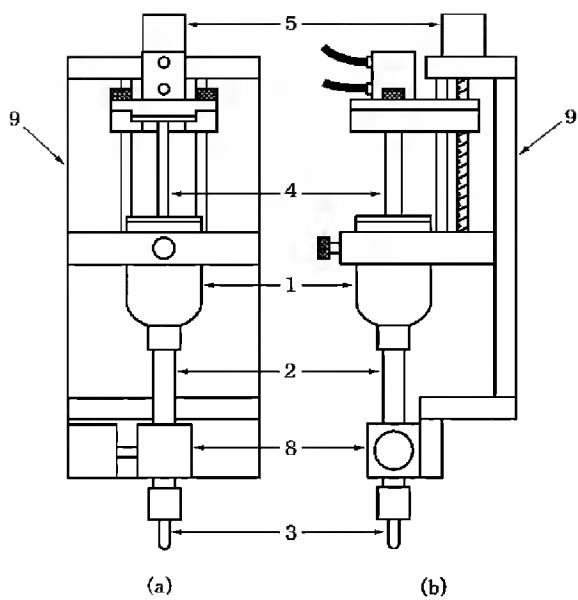
【図1】



【図2】

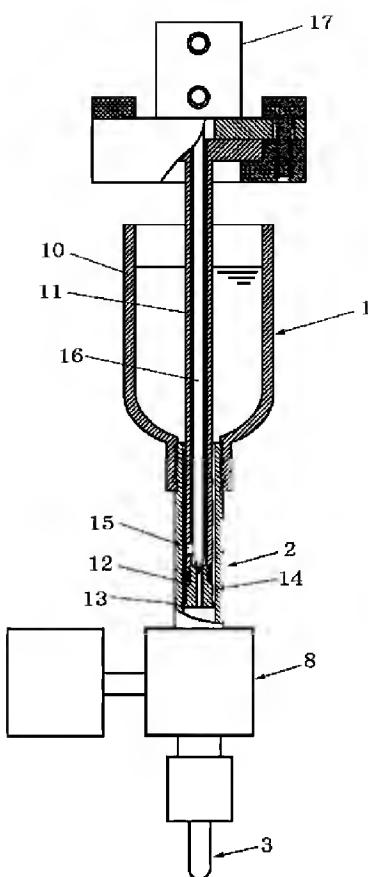


【図3】



(b)

【図4】



フロントページの続き

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 BA53